

TRACK PARAMETERS

STC/SBC.

The parameters which are normally measured in Permanent way are as follows.

1. Gauge

2. Twist (by measuring cross levels)

3. Alignment (by measuring versines in a curve)

4. General condition of track (in case of derailments)

A brief introduction of P.Way Components

- The basic components of Permanent way are
 1. Rails
 2. Sleepers
 3. Ballast
 4. Fittings for Rails and sleepers

RAILS

- Types of Rails used in IR are

BG

60 KG/m

52KG/m

90 R

MG

90R

75R

60R

SLEEPERS

1. Pre stressed Concrete sleepers (PSC)
2. Steel sleepers (ST)
3. CST – 9 Sleepers
4. Wooden sleepers

Fittings/Fastenings for Rails and sleepers

Rail Fastenings

1. Fish plates



2. Fish bolts



Sleeper fastenings

Wooden sleeper

Bearing plates – MS Canted bearing plate

ACB plate

Spikes/Screws – Round spikes

Plate screws

Rail Screws

(Dog spikes)

Steel keys

Steel sleepers



Fastenings for steel sleepers

- Pandrol clips/ Steel keys
- Modified loose jaws/ ordinary loose jaws

Fastenings for CST-9 sleepers

- Steel keys
- MS Tie bar
- MS cotters

PSC sleeper Fastenings

- GRP (Grooved Rubber Pad)
- Liners (Metal/GFN)
- ERC (Elastic Rail Clips)

In case of PSC sleepers Periodical greasing of ERCs is to be done to avoid jamming.

(Periodicity)

Ballast

- Stone ballast is generally used in all types of track.
- In olden days ballast like sand, cinder, murrum etc., were being used.
- Minimum Recommended depth of clear ballast cushion for BG tracks.

A - 300mm, B&C – 250mm, D – 200mm,

E – 150mm

GAUGE

- It is the horizontal distance between the gauge faces of rails measured at 13 to 15mm from the rail top.
- BG – 1676mm
- MG – 1000mm
- NG – 762mm and 610mm
- It is measured with the help of Gauge cum level instrument.

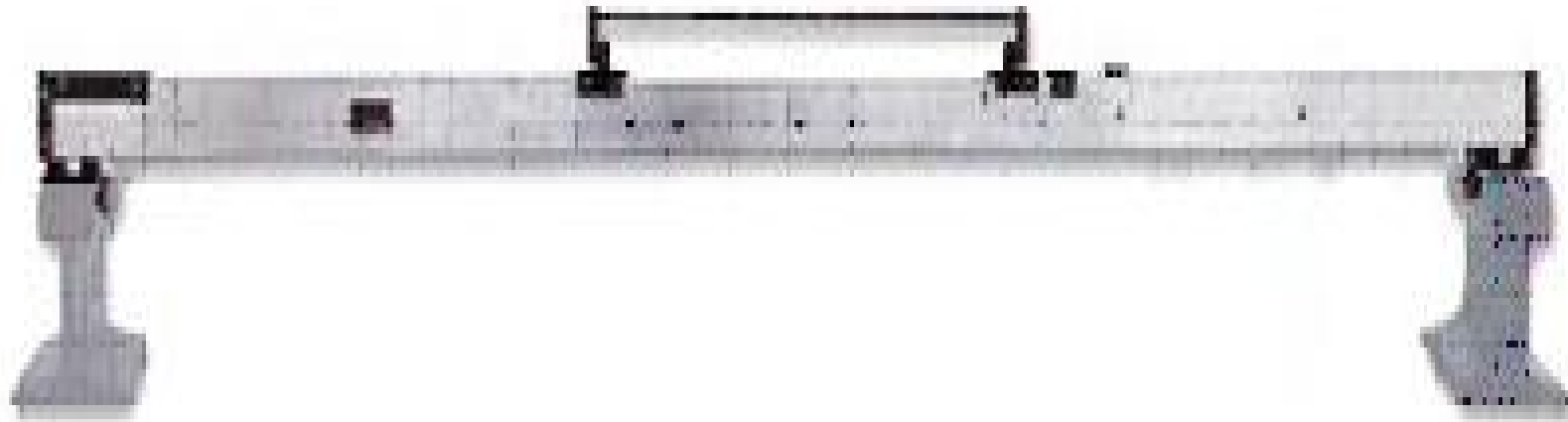
Maintenance tolerances for gauge

- **Broad Gauge**
- a) On straight -6mm to +6mm
- b) On curves with radius } -6mm to +15mm
350 m or more
- c) On curves with radius } upto +20mm
less than 350 m

Maintenance tolerances for gauge

- **Metre Gauge**
- a) On straight -3mm to +6mm
- b) On curves with radius }
290 m or more -3mm to +15mm
- c) On curves with radius }
Less than 290 m } Upto +20mm

Gauge cum level Instrument



With this instrument Gauge can be measured between -10mm to +20mm. Beyond this tape can be used.

CROSS LEVEL

- It is the level difference between two rails measured in mm with respect to one rail.
- Measured with the help of spirit level mounted over the gauge cum level.
- e.g. 10LL, 6RL, 4LL, 5RL etc.,
- LL means Left low
- RL means Right low

TWIST

- Twist is the calculated parameter with the readings of cross levels measured on track.
- It is defined as the rate of change of cross levels over a given base.(Algebraic difference)
- It is denoted as mm/m.
- For example if the difference in cross levels measured at an interval of 3m is 6mm then Twist = $6/3 = 2\text{mm/m}$.(Depends on wheel base)
- On good riding comfort point of view for the passengers the value of twist is limited to 2.8mm/m.

ALIGNMENT

- It is measured in terms of versine on a curve over a chord length at common intervals.
- In curves of plain track the versine is measured on 20m chord at the intervals of 10m.
- In points and crossings the turn in and turn out curves are measured on 6m chord at 3m intervals

Service limit for station to station versine variation

Speed Range	Limits of station to station Variation (mm)
120 Kmph and above	10 mm or 25% of the average versine on circular curve whichever is more
Below 120 Kmph and upto 80 Kmph	15 mm or 25% of the average versine on circular curve whichever is more
Below 80 Kmph and upto 50 Kmph	40 mm or 25% of the average versine on circular curve whichever is more

CURVES

- Super Elevation – It is the amount by which the outer rail is raised over inner rail
- The formula for calculating SE

$$SE \text{ (in mm)} = \frac{GV^2}{127R}$$

Where

G= Dynamic gauge in mm(1750 for BG, 1000 for MG), V=Max.Per.Speed in KMPH and
R= Radius in 'm'

CURVES

- Degree of curvature –The angle subtended at the center by a chord of 30.5 metres
- The radius for 1^o curve is 1750m
- The radius is inversely proportional to the degree of curvature
- The relation between Degree and radius is
$$D = \frac{1750}{R}$$

R

RADIUS

- If we know the versine and chord length, we can calculate the radius with the formula

$$R(\text{in m}) = \frac{125C^2}{V} \quad (C = \text{Chord length in 'm'})$$

V (in mm)

- The max. permissible curvature in BG is 10^0
i.e. the radius should not be less than 175m.

Max. Permissible SE

The max. permissible super elevation in BG

For A, B & C routes – 165mm

For D & E routes - 140mm

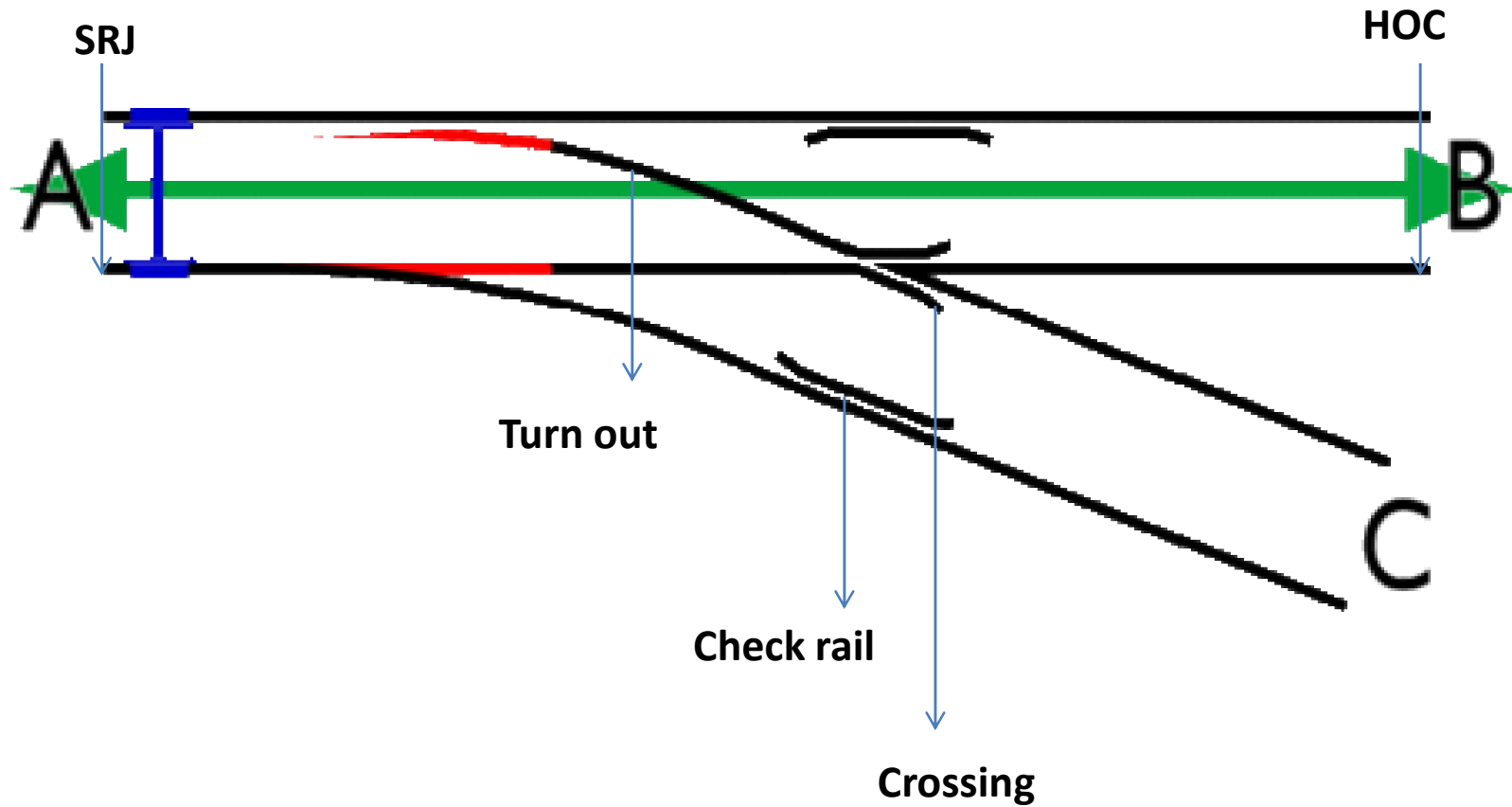
For MG – 90mm

For NG - 65mm

Types of routes in BG

- A route – Speed limit is up to 160kmph
- B route – Speed limit is up to 130kmph
- C route – Suburban sections of Mumbai, Kolkata, Delhi and Chennai.
- D route – Speed limit is 100kmph
- E route – Branch lines with speed less than 100 kmph.

Points and crossings



Points and crossings

- P&C are denoted with their angle of crossings such as 1 in 8.5, 1 in 12 etc.,
- Speed over 1 in 8.5 turnouts is 10kmph, and 1 in 12 turnouts is 15 kmph.
- In case of curved switches it is 15 kmph for 1 in 8.5.
- For 1 in 12 turnouts with PSC sleepers the speed can be increased to 30kmph with spl. approval.

Level Crossings

- The parameters to be checked in case of LCs are

Condition of road surface

Check rail clearance (Min-51, Max.-57mm)

Visibility for road users

Availability of road sign boards

Girder bridges

- Guard rail clearance 250 ± 50 mm
- The guard rail should not be higher than running rail by not more than 25mm
- Full compliments of fittings are to be available on bridges.
- Inspection and painting once in 5 yrs.
- Greasing once in 3 years.

Track readings in Acc.spot

- Point of mount or point of drop to be established
- Track readings to be taken for 9m in rear of PM/PD at every sleeper and at 3m intervals for 90m
- For 45m over affected portion in the same manner
- Joint observations on general condition of track is to be recorded.

- Accident sketch is to be prepared involving all the features such as position of PM/PD, Derailed wheels, direction of movement, track gradient, location of any fallen objects or foreign bodies.
- When the cause for the derailment is clearly established as other than track defect track readings need not be taken.